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Perfect and robust phase-locking of a spin transfer vortex nano-oscillator to an external microwave source

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Abstract

We study the synchronization of the auto-oscillation signal generated by the spin transfer driven dynamics of two coupled vortices in a spin-valve nanopillar to an external source. Phase-locking to the microwave field h rf occurs in a range larger than 10% of the oscillator frequency for drive amplitudes of only a few Oersteds. Using synchronization at the double frequency, the generation linewidth is found to decrease by more than five orders of magnitude in the phase-locked regime (down to 1 Hz, limited by the resolution bandwidth of the spectrum analyzer) in comparison to the free running regime (140 kHz). This perfect phase-locking holds for frequency detuning as large as 2 MHz, which proves its robustness. We also analyze how the free running spectral linewidth impacts the main characteristics of the synchronization regime. © 2014 AIP Publishing LLC.

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